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## CLINTON LABORATORIE

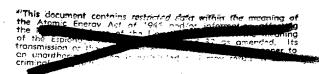
## CENTRAL FILES NUMBER 48-2-136

B-137  Date February 6, 1948  Subject A CRUDE ESTIMATE OF THE C <sup>14</sup> IN THE PILE STACK GASES  By Ross S. Thackeray					File	Those Eligible To Read The Attached		
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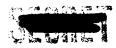
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## MONSANTO CHEMICAL COMPANY CLINTON LABORATORIES

DATE February 6, 1948

Dr. K. Z. Morgan

DEPARTMENT Health Physics

DEPARTMENT

Health Physics

Ross S. Thackeray

A CRUDE ESTIMATE OF THE C14 IN THE PILE STACK CASES

An estimate of the C14 activity run out the pile stack in a day has been made for the current pile operating level of approximately 4000 IN. It is based on the measured argon activity in the stack gas in March, 1944 1. It was found then that there was 5.65 x 10-1 curies/cm3 of Argon when the pile was operating at 870 KW and the total exit cooling air flow was 51,000 ft3/min.

The total number of A41 curies exhausted per day now is found from the following formula:

 $5.65 \times 10^{-11}$  (curies/cm<sup>3</sup>/870 KW of pile power) •  $\frac{4000}{870}$  (No. of 870 KW

units) x 5.1 x  $10^4$  (ft/min air flow) x 2.84 x  $10^4$  (cm<sup>3</sup>/ft<sup>3</sup>) x 60 (min/hr)

x 24 (hrs/day) = 540 curies/day of  $A^{41}$  at 4000 KW pile power.

To calculate the amount of C14 currently being produced, we make the following statements and assumptions:

- 1) That the pile cooling air volume and pressure are the same as in 1944.
- That in a given volume of air there are 170 times as many nitrogen atoms as argon atoms.
- 3) That the cross-section for .025 ev neutron absorption by Argon 40 is .62 barns 2.
- 4) That the cross-section for .025 ev neutron absorption by Nitrogen 14 is 1.5 barns 3. We assume here that the resonance absorption CLASSIFICATION CANCELLED between .2 and 1.7 Mev is negligible.
- 5) That the half-life of Cl4 is 5100 years 4.

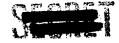
DATE 8/28/67

For The Atomic Energy Commission

Kanne and Wilkenson, CP - 1300, March 6, 1944.

Shief, Declassification Branch (Le

2 and 3. K. Way and G. Haines, Tables of Neutron Cross-Sections, Mon P - 405, October 31, 1947.



## K. Z. Morgan

February 6, 1948

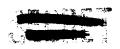
Accepting these statements, the curies per day of Clarelessed may be estimated from the curies per day of Att by the following formula:

540 (curies of 
$$A^{41}/\text{day}$$
) x  $\frac{110}{5100 \cdot 365 \cdot 24 \cdot 60} \left(\frac{1/2 \text{ life of } A^{41}}{1/2 \text{ life of } C^{14}}\right)$ 

If it is assumed that the research pile will produce 3 times as much  $Argon^{4}$  as the X - pile, the expected  $C^{14}$  production would be approximately .03 curies/day.

R. S. Thackeray

RST: mco



<sup>4.</sup> Reid, A. F. et al, Physical Review, 70, 431, 1946.
Norris, L. D., and Ingraham, M. G., Physical Review, 70, 772, 1946.
Norris, L. D., Mon P - 314, October, 1947.
Libby, W. F. et al, CC - 3780, May, 1947.